Histopathologic Study of Sinonasal Lesions: A Hospital Based Retrospective Study, From January 2016 to August 2020

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Declaration of Principal Investigator

I the undersigned, Ruth Abera agree to accept all responsibilities for the scientific and ethical conduct of this thesis entitled "**Histopathologic study of Sinonasal lesions: A Hospital Based Retrospective Study, From January2016 to August 2020.**

The Thesis is my original work and was not prepared by others. All resources and materials used for this research have been dully acknowledged. I was communicating and providing timely progress report to my advisor and seek the necessary advice, comment and approval in the course of this work.

Ruth Abera Alemayehu (MD), Final Year Pathology Resident:

_____ _____

Signature Date

Approval of Advisor:

The Student had worked on this research and fulfilled all the requirements and hence hereby can submit the thesis to the Department of Pathology, Tikur Anbessa Specialized Hospital, School Of Medicine, College of Health Sciences, Addis Ababa University.

Dr Tufa Gemechu (MD), Associate Professor of Pathology:

_____ _____

Signature Date

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Abbreviations and Acronyms

AAU:	Addis Ababa University
ADENO:	Adenocarcinoma
ADNCY:	Adenoid cystic carcinoma
B.C.C:	Basal cell carcinomas
FMAAU:	Faculty of Medicine, Addis Ababa University
DNA:	Deoxyribo Nucleic Acid
HIV:	Human Immunodeficiency Virus
HNCA:	Head and neck cancer
HPV:	Human papilloma virus
KSCC:	Keratinizing squamous cell carcinoma
LYM:	Lymphoma
NKSCC:	Non-keratinizing squamous cell carcinoma
N.B:	Neuroblastomas
NC:	Nasal cavity
NHL:	Non-Hodgkin's lymphoma
ONBSM:	Olfactory neuroblastoma
PNS:	Paranasal sinus
SCC:	Squamous cell carcinoma
SCM:	Sarcoma
SPSS:	Statistical Packages of Social Sciences
TASH:	Tikur Anbessa Specialized Hospital
UC:	Undifferentiated carcinoma
WHO:	World Health Organization

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Abstract

Background: Sinonasal area is a host to various neoplastic and non- neoplastic lesions. The presenting symptoms of sinonasal lesions are similar and pose difficulty for diagnosis based on clinical features and advanced imaging modalities, which makes histopathology the principal diagnostic tool approach for these lesions. The aim of this study is to determine the various histopathologic types of Sinonasal lesions, their classification and relative distribution with regards to age and sex in our setting.

Materials and Methods: A retrospective cross-sectional descriptive study conducted on 306 cases of sinonasal lesions over the period from January 2016 to August 2020. All the sinonasal tissues were received and diagnosed at histopathology section of Department of Pathology in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. The Pathology reports were collected from the pathology data archives; and the variables of study were extracted by using a data extraction sheet, and data analysis was done using SPSS version 26.0.

Results: Most affected age group was 21-30 years 81(26.5%). Male predominance was observed with M: F ratio of 1.4:1.Nasal cavity was the commonest anatomical site involved 237(77.5%).There were 137(44.8%) Non-neoplastic lesions and 169(55.2%) Neoplastic lesions. Inflammatory Sinonasal Polyps 100(73.0%) were the most common among non-neoplastic lesions; inverted Sinonasal Papilloma 34(41%) the most common among the benign neoplastic and squamous cell carcinoma and nasopharyngeal carcinoma accounting for 21(25.6%) cases each, were the commonest malignant lesions.

Conclusion: clinical findings and advanced image modalities can reach to a presumptive diagnosis for the sinonasal lesions but histopathology remains the gold standard for categorizing and diagnosis of non-neoplastic and neoplastic lesions of sinonasal tract.

Keywords: Histopathology,Sinonasal lesions, Neoplastic and Non-neoplastic, Tikur Anbessa Hospital, Addis Ababa, Ethiopia

1. Introduction

1.1 Background

The nose is the most prominent part of the face with substantial aesthetic and functional significance [1] .Its anatomical location makes it exposed to different pathogenic factors. The nasal cavity and Para nasal sinuses including the maxillary, Ethmoid, Sphenoid and Frontal sinuses are collectively referred to as the Sinonasal tract [2]. The collectively termed, sinonasal area, serves as a host to a variety of neoplastic and non-neoplastic diseases which are labeled as sinonasal lesions.

Paranasal sinuses are small air filled cavities occupying the corresponding facial and skull bones named as Ethmoid, Maxillary, Sphenoid and Frontal Sinuses'. Two main types of epithelium lining, the nasal cavity and paranasal sinuses are, stratified squamous and ciliated pseudostratified columnar respiratory epithelium which is ectodermal derived and also called Schneiderian membrane, with some areas having intervening zone of an intermediate or transitional type of epithelium, primarily functioning for filtering, humidifying and adjusting temperature of inspired air. In addition, the nasal cavity also contains neuroepithelial, olfactory epithelium and mesenchymal tissues like muscle, bone, cartilage and vascular structures. These incorporate neoplasms derived from mucosal epithelium, seromucinous glands, soft tissues, bone, cartilage, neural/neuroectodermal tissue, haematolymphoid cells and the odontogenic apparatus [3].

As mentioned above, the nasal cavity is the site of the greatest variety of tumors in the upper respiratory tract. The symptoms of tumors of nose and paranasal sinuses often masquerade as chronic inflammatory condition [4],in addition to similar clinical presentation; various imaging modalities find it difficult to differentiate benign lesions from malignant ones. Therefore, an early diagnosis and treatment of any obstructive lesion is necessary.

Fine needle aspiration and cytologic studies are not usually performed in these areas with reasons having to do with difficulty in accessing the site and also with complication of bleeding during these procedures. Since it is difficult to differentiate benign from malignant lesions based on clinical features and advanced imaging, histopathology, thus, remains the main diagnostic

approach for the lesions of the sinonasal tract [5]. Because of the diverse group of lesions seen in both nasal cavity and paranasal sinuses and the similarity in their clinical manifestations; makes this particular area in the head and neck region remarkable for in depth study.

This retrospective study was done to determine the histopathologic types of sinonasal lesions with regard to age and sex distribution, in Tikur Anbessa specialized Hospital, Department of Pathology, Faculty of Medicine, Addis Ababa University between January 01, 2016 and August 31, 2020.

1.2 Statement of the Problem

Nasal lesions mostly present with nasal masses in various treatment centres. Common presenting symptoms of sinonasal lesions are nasal blockage, nasal discharge, epistaxis, facial swelling, orbital and ear symptoms [6]. A variety of non-neoplastic including congenital and inflammatory lesions and neoplastic conditions involve the nasal cavity and paranasal sinuses.

Benign sinonasal lesions are common but malignant lesions on the other hand, account for less than 3% of head and neck malignancies and less than 1% of all malignant tumours. It affects mostly the African, Japanese, and the Arab and very rare in America and western europe [6]. Congenital masses are predominantly mid line swellings and include Dermoids, Glioma and Encephaloceles as common diagnosis [7]**.**

Nasal polyps are a common cause of nasal obstruction in adults with a prevalence of about 4% in the general population. Among these polyps including inflammatory and allergic are the most common sinonasal lesions and other non-neoplastic lesions include bacterial and fungal infections [8, 9]. The presenting symptoms of these tumors are similar and using advanced imaging a presumptive diagnosis is often made. However, histopathological examination is mandatory to decide the pattern of any particular lesion including malignancy.

The nasal mucosa and sinuses share similar histology and biological behavior. For these reasons all Papillomas occurring in this particular site are collectively called Sinonasal Papillomas [10]. Sinonasal Papilloma also called Schneiderian Papilloma is a rare disease with the Inverted

Papilloma morphological variant, being the most common one. Inverted Papilloma has a recurring behavior after treatment with additional potential to malignant transformation of all the Sinonasal Papillomas. Benign Papillomas are associated with the low risk HPV types 6 and 11, whereas their malignant counterparts are closely related to HPV-16 DNA [10].

Nasal cavity and Paranasal sinus cancers are a group of rare cancers, representing about 5% of all head and neck cancer patients. About 60% of sinonasal tumors originate in the maxillary sinus, 20–30% in the nasal cavity, 10–15% in the Ethmoid sinus, and 1% in the Sphenoid and Frontal sinuses [11]. Head and neck malignant neoplasms constitute up to5-50% of all malignancies seen globally and on average, about 85% of malignancies seen in children occur in developing countries where majority of such countries are in Africa. Previous studies done in Nigeria in pediatric age group showed the nose and paranasal sinuses to be the commonly affected anatomical sites [12].

According to WHO(world health organization) the most common epithelial sinonasal cancer is squamous cell carcinoma (SCC), the non-keratinizing (NKSCC), subtype accounting for approximately 10-27% of sinonasal SCC, with male predominance. Risk factors for both KSCC and NKSCC were cigar rete smoking, wood dust, leather dust and other industrial exposures, but 30-50% of NKSCC were associated with high risk HPV [13].

Studies done in Ethiopia and other Sub-Saharan African countries showed excess tobacco smoking, alcohol intake and HIV infection as a predisposing factors in development of Squamous cell carcinoma of the head and neck region including the sinonasal tract. These studies also suggested HIV infected patients tend to present at a younger age with more aggressive cancers and worse clinical outcomes. These patients may have an increased acquisitions of oncogenic HPV strains at multiple anatomic sites. However, contribution of HPV to head and neck cancers is not well described in our continent [14, 15, 16, 17].

Other Studies and reviews done in different parts of the world also showed similar results stating, across all head and neck sites, the most common histology is squamous cell carcinoma, with similar affected age group, gender, risk factors and anatomic site [16,18,19].

1.3 Significance of the Study

The anatomy of sinonasal region is very complex and unique. Lesions that occur in the sinonasal tract have a predilection for a specific site. Tumours arising in these regions show an overlapping histologic feature, which presents a considerable diagnostic difficulty for the pathologist. Since there are different treatment modalities for each tumour, it is essential to entertain and sort out variety of neoplastic and non-neoplastic lesions to reach at a specific diagnosis, despite similar clinical presentations.

In Tikur Anbessa Specialized Hospital (TASH) which is the biggest referral hospital in Ethiopia, nasal cavity and paranasal sinus lesion specimens are received, processed and given a histopathologic diagnosis in department of Pathology, Faculty of Medicine, Addis Ababa University (FMAAU). However, to the best of our knowledge there has not been a recent or published study done on the histopathologic types of sinonasal lesions in Ethiopia.

2. Literature Review

Sinonasal area, despite having occupied a small anatomic site in the head and neck, is a source of heterogeneous, non-neoplastic and neoplastic lesions. In addition to the heterogenousity, the clinical presentation of these lesions are similar and advanced imaging modalities find it difficult to differentiate benign from malignant tumours which makes a histopathologic study an important diagnostic tool for definitive diagnosis.

Different literatures are written around the world regarding the histopathologic spectrums of sinonasal lesions. Literatures written in developing countries like, sub Saharan African countries, are very helpful in our setting with concerns to the incidence of a specific histologic diagnosis, because of the similarity in population demographic characteristics and most importantly; since there is difficulty in large availability of Immunohistomarkers, we rely on gross microscopic finding in relation with an epidemiologic distribution of the different histopathological lesions with regards to age, sex and anatomical site, to reach at a specific diagnosis.

Below are literature reviews done having similar objectives with our study:
In India studies done in three different hospitals for histopathology patterns of sinonasal lesions in years 2020, 2019 and 2016 showed similar results with patterns of lesions and their distribution regarding to age and sex, but differed in prevalence of specific lesions.

A two year retrospective and prospective study done, from September 2011 to August 2016 and September 2011 to August 2018, 122 cases were analyzed and they found, 71 (58.20%) were males and 51 cases (41.80%) were females and non-neoplastic cases belonged to 21-30 and 31-40 years of age (24 cases each, 24.49%). Benign lesions were noted in fourth and seventh decade (3 cases each, 23.08%) whereas malignant lesions were reported in 61-70 years age (4 cases, 36.36%). The non-neoplastic cases were (98 cases) neoplastic cases (24 cases). Benign lesions (13cases, 10.66%) were higher than malignant lesions (11 cases, 9.01%). The commonest non neoplastic, benign and malignant lesions were Sinonasal polyps (85.72%), Hemangioma (46.16%) and squamous cell carcinoma (36.37%) respectively [20].

The other retrospective study done between October 2013 and September 2015, where 125 cases analyzed also showed 69 were males and 56 were females with M:F ratio of 1.23:1, the 72 (57.60%) were non neoplastic and 53 (42.40%) were neoplastic, 32 (60.38%) were benign and 21 (39.62.%) were malignant and the commonest benign lesions were 12 (37.50%) inverted Papillomas, malignant neoplastic lesions in descending order were, 4 (10.04%) Neuroblastomas (N.B), 3 (14.28%) basal cell carcinomas (B.C.C), and 3 (14.28%) squamous cell carcinomas (S.C.C).The study also included lesions originating in specific anatomical sites, 80(64.00%) cases were arising from the nasal cavities, 20 (16.00%) paranasal sinuses, 15(12.00%) external nose and 10 (08.00%) from nasal septum. Maximum numbers of nasal lesions were detected in age group of 11-20 years with 32 (40.00%) cases [21].

The third two year retrospective study of 120 cases between June 1, 2014 and may31, 2016 showed, common presentation age ranged from 5 to 60 years with a mean age of 33 years. Most patients were in the age group of11-20 years (but age distribution with specific pattern of lesion wasn't determined). There were 74 (61.67%) males and 46 (38.33%) females with M: F ratio of 1.61:1, 83 sinonasal masses (69.17%) were non-neoplastic and 37 (30.83%) neoplastic lesion. All the non-neoplastic masses were nasal polyps. 33(27.50%) were benign tumors and 04 (3.33%) malignant tumors. Angiofibroma 18 (15.00%) and Squamous cell carcinomas, 2(1.67%) were the commonest benign and malignant tumors respectively [22].

In Pakistan a hospital based retrospective study done on clinic pathologic patterns of sinonasal space occupying lesions, between January1, 2011 and December 31, 2016 in 68 case analyses showed, the mean age of 31.55±13.5 years with age range of 15 to 65 years. Male patients were (67.64%) and female (32.35%) and male to female ratio was 2.09:1. Nasal obstruction was present in 57 (83.82%). The common non neoplastic lesion was inflammatory nasal polyp 34 (50.0%). Inverted papilloma 9 (13.23%) and squamous cell carcinoma 5 (7.35%) were the commonest benign and malignant lesions respectively [23].

In Nepal, a retrospective, three year study of benign nasal lesions with clinic pathological and radiologic profile, between April 2005 and March 2008 in 331 cases analysis revealed, age ranged from 1st to 8th decade with highest incidence in 16-30 years (44%) with 80% falling

under 45 years. The male to female ratio was 3:2, 293 non-neoplastic and 38 neoplastic lesions and nasal polyps (70%) were the commonest non-neoplastic lesions followed by Rhinosporidiosis (10%). Fungal sinusitis, squamous Papillomas, Hemangiomas and Inverted Papillomas were found in 4.5%, 4%, 3.5% and 3%, respectively. The incidence of non-neoplastic masses was 87% out of which 15% were infective. Only 13% cases were benign neoplastic masses [24].

A study in Sri Lanka showed similar results with Nepal where it was done retrospectively on lesions of Sinonasal and Nasopaharynx, over three years between January 1 2015 and December 31,2017 in an analysis of 238 cases and showed the commonest site was the Nasal Cavity (NC) (51.06%) followed by the Paranasal Sinus (PNS) (43.9%). Male to female ratio was 1.38:1. 79.8% were non-neoplastic, of which 88.9% were inflammatory and 7.3% were fungal, where Mucormycosis and Rhinosporidiosis being the commonest. Of the neoplastic (20.8%) conditions ,(54.1%) and(42.3%) were benign and malignant lesions , with highest number of inverted papilloma(42.3%) and Squamous cell carcinoma (40.9%), commonly seen in 6th and 7th decades and in 7th and 8th decades, respectively[25].

In Saudi Arabia, Aseer region, a hospital based retrospective study was done in years between 2012 and 2017.One hundred and twenty one patients who underwent surgery for nasal polyps above twelve years of age were analyzed and showed , most patients (58.7%) were males. Their mean age was 38.2±14.6 years. The majority of patients (81.8%) had bilateral nasal polyps and polyps were recurrent in (33.1%) of patients. The most frequent histopathological features were edematous including eosinophils (61.2%) and polyps were fibro-inflammatory type (30.6%) [26].

In Rwanda a seven month cross sectional descriptive study in three hospitals, from June to September 2015 with analysis of 79 patients showed, patients were aged between 2 to 79 years with a mean age of 36.5 (±20.15) years. Of which, 35 (44.3%) were males and 44 (55.7%) females, with M: F of 1:1.25. Lesions were 36 (45.57%), non-neoplastic 34 (43.04%) benign and 9 (11.39%) malignant respectively. Of the non-neoplastic lesions, inflammatory polyps (36 cases), most common in second and third decades, were highest. Commonest benign neoplastic

lesions, Lobular Capillary Hemangioma (9 cases) higher in females of the third decade, followed by inverted papilloma (8 cases) prevalent in males of the sixth decade were noted and in the malignant tumors, squamous cell carcinoma was common (4 patients) and prevalent in the eighth decade of life (2 patients) [27].

In Nigeria a six year retrospective study on clinic pathologic profile of Sinonasal masses in national ear care centre, Kaduna, between 2003 and 2008 with analysis of 76 patients, revealed, the age of patients ranged from 5-64 years with a mean age of 33.3 yr. There were 34 males and 42 females with M: F ratio of 1:1.2.common presenting symptom being nasal blockage (97.4%). Simple nasal polyp in 47(61.8%) of which, those with Ethmoidal polyp (31) were males and (16) Antrochoanal polyp occurred in 10 (13.2%) in patients less than 20 years (60%), of age. Of the neoplastic lesions 59 (77.6%) were benign and 2 (2.6%) were malignant. Commonest benign lesion being (18%) inverted papilloma, with M: F ratio of 1:1.5. Prevalence of commonest specific malignant lesion was not determined in the study [28].

Another six year retrospective study done in a different hospital, Nigeria, on sinonasal cancers and their outcomes, from January 2008 to December 2013 with analysis of 22 patients (total of 22 patients diagnosed as sinonasal cancer out of 71 patients (31%) with head/neck cancers during the study period) and there were 12 males (54.5%) and 10 females (45.5%). Age ranged from 40 to 70 years of age with mean age of 51 years. Well-differentiated squamous cell carcinoma was the most common (54.6%) histology followed by non-intestinal well-differentiated adenocarcinoma in 18.2% [29].

In Tanzania, a hospital based retrospective study done from July 2012 to January 31 2013 on patterns of head and neck cancer with analysis of 113 patients showed 75 (66.3%) were males and 38(33.7%) females with M: F of 2:1. Patient's age ranged from 16 to 88 years (mean age= 51 years ± 18). Those aged 41-60years were common for the majority of cases (42%). Patients with head and neck cancer below 20 years constituted 5.3%. Most common histology was squamous cell carcinoma (74.3%), where it involved the sinonasal area16 (14.2%) next to larynx 20 (17.7%). Sinonasal cancer was the most frequent head and neck cancer (HNCA) 27(24.7%), And showed the most diversity in histology than any other HNCA including ADNCY 1(0.9%),

SCC 16(14.2%), SCM 2 (1.8%),ONBSM 3 (2.7%), ADENO 2 (1.8%), LYM 2 (1.8%) and UC 2(1.8%)in the conducted study [14].

Another study done in Tanzania, in a different hospital on clinic pathologic profile and management of HNCA in years January 2009 to December 2013 with analysis of 346 patients showed M: F 2:1 and a median age of 42 years the nose and paranasal sinuses 39 (11.3%), were the fourth anatomical site to be involved by the HNCA with SCC (75.5%) still being the commonest histology [15].

A study done in India on histopathologic study of lesions of nose and Paranasal sinuses and association of HPV with Sinonasal Papillomas and squamous cell carcinoma from years January 2010 to 2013 with analysis of 181 cases revealed inverted papilloma being the commonest benign lesion while squamous cell carcinoma was the commonest malignant lesion. Four out of 30 Inverted Papillomas, 3 out of 6 Exophytic Papillomas tested positive for HPV, while 2 out of 9 squamous cell carcinomas were positive for high risk HPV [30].

3. Objective

3.1 General Objective

- To determine the histopathologic types of sinonasal lesions in our setting.

3.2 Specific Objectives

- To determine histopathologic types of sinonasal lesions
- To describe classifications of sinonasal lesions.
- To determine relative distribution of sinonasal lesions with regard to anatomical site, age and sex in the setting.

4. Methods

4.1 Study Area and Period

This study was conducted in Addis Ababa, the capital city of Ethiopia. Ethiopia is the largest and most populated country on the horn of Africa with estimated population of more than 100 million. Addis Ababa, the capital, has about 52 hospitals of which 12 are state run and out of these TASH is the largest referral and teaching hospital in the country.

Pathology is one of the actively functioning departments found in the institution and gives haematology, cytopathology, surgical pathology and neonatal autopsy services. Diagnoses of lesions along with the process of teaching and learning are conducted by well-respected Pathologists. The department receives around 10,000 surgical specimens per year and sinonasal specimens being among them.

4.2 Study Design

This study is hospital based retrospective study. sinonasal specimens diagnosed in pathology department, TASH from January 01, 2016 to August 31, 2020 were assessed.

4.3 Study Population

All cases whose sinonasal specimens submitted and diagnosed in Pathology department, TASH during the specific study period.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion Criteria

- All patients whose sinonasal specimens submitted and diagnosed in pathology department, Tikur Anbessa Specialized Hospital, during the specific study period.

4.4.2 Exclusion Criteria

- Cases diagnosed before the year 2016 were excluded from the study
- Cases with one or more missing variables were excluded from the study
- Cases without clear or specific diagnoses were excluded from the study

4.5 Sample Size Determination

Sample size was determined based on the patient samples fulfilling the inclusion criteria during the specified study period.

4.6 Sampling Procedure

All cases with labelled anatomical site as nasal cavity and paranasal sinuses with their corresponding histopathology from January 01, 2016 to August 31, 2020 were reviewed from the archive of the Pathology department.

4.7 Data Collection Tools and Procedures

All of the pathologic diagnoses were made based on formalin fixed, paraffin embedded tissue sections stained with Hematoxylin and Eosin. Signed out pathology reports were reviewed in the study period. All demographic data and their corresponding histopathology diagnoses were extracted from the reported hard copy using data extraction sheet.

4.8 Data Quality Assurance

The data was collected and extracted by the principal investigator. The quality was controlled, before, during and after data extraction, as follows:

4.8.1 Before Data Extraction: the principal investigator designed the data extraction sheet with the study variables. The diagnosis reports were located from the archive of the Pathology department in TASH.

4.8.2 During Data Extraction: the principal investigator extracted the data using the designed data extraction sheet from the pathology archives chronologically from the year, 2016 to 2020.

4.8.3 After Data Extraction: the principal investigator checked the completeness of the extracted study variables in the extracted data sheet, cleaned and coded.

4.9 Data Processing and Analysis

After the data quality was assured, it was entered in to SPSS software 26th version and re-cleaned for analysis. Cross tabulations as well as graphic presentations were done. Results have been presented in tables, graphs and texts.

4.10 Ethical Consideration

In conducting this study, the ethical consideration was respected. Permission was obtained from the Ethics committee of the Department of Pathology, School of Medicine, and College of Health Sciences of Addis Ababa University. Names of patients or their chart numbers were not written on the data extraction sheet to respect the confidentiality of patients. Hence, the data was an anonymous link.

5. Results

A total of 350 cases were reviewed and 44 cases were excluded from the study because of incomplete socio-demographic data and histopathologic reports; with “see description” and suspicious and suggestive diagnoses. This study included 306 cases of sinonasal lesions with a histopathologic diagnosis. The histopathologic diagnoses were categorized in to non-neoplastic and neoplastic lesions. The neoplastic lesions were further categorized as benign, malignant and potentially malignant. Cases reported with any degree of dysplasia were categorized as potentially malignant lesions. Various factors regarding distribution with age, sex, anatomical site and histopathological characteristics were analysed.

The most affected age group in our study was 21-30 years 81(26.5%) and the least affected group was 81-90 years 2(0.7%) (Figure 1). The minimum age was 1 year and maximum was 90 years, with the mean age of 36.62 years.

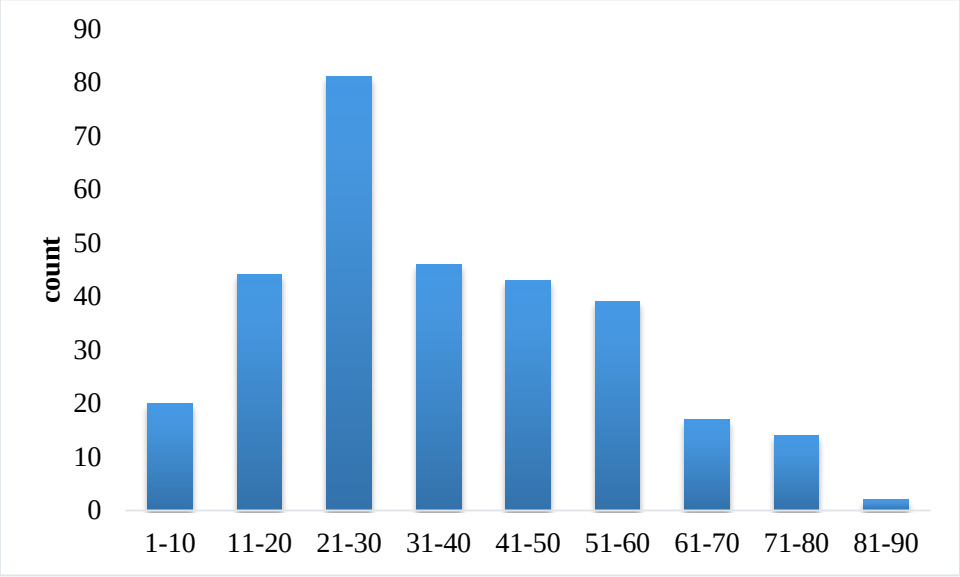

Fig. 1: Age Distribution of Patients with Sinonasal Lesions

Male 180(58.8%) predominance was seen compared to females 126(41.2%) with a ratio of 1.4:1 (figure 2). Female predominance 20(6.5%) was seen in only 51-60 years of age group compared to the males 19(6.2%) (Table 1).

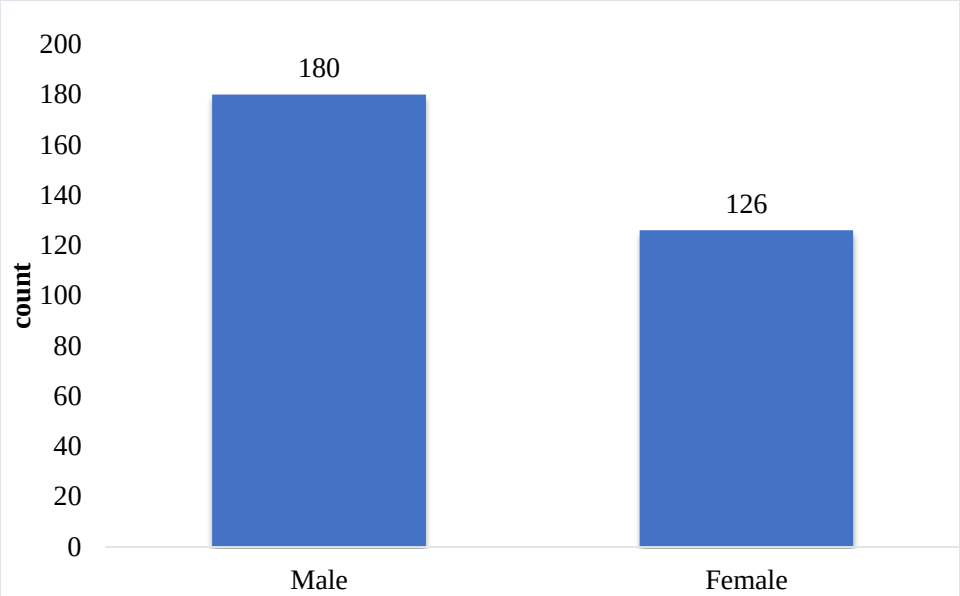

Fig. 2: Sex Distribution of Patients with Sinonasal Lesions

Table 1 : Age and Sex Distribution of Patients with Sinonasal Lesions

Age group	Male	Female	No. of cases	% of total cases
	Count (%)	Count (%)		
1-10	14 (4.6%)	6 (2.0%)	20	6.5%
11-20	32 (10.5%)	12 (3.9%)	44	14.4%
21-30	**42 (13.7%)**	**39 (12.7%)**	81	26.5%
31-40	25 (8.2%)	21 (6.9%)	46	15.0%
41-50	24 (7.8%)	19 (6.2%)	43	14.1%
51-60	**19 (6.2%)**	**20 (6.5%)**	39	12.7%
61-70	13 (4.2%)	4 (1.3%)	17	5.6%
71-80	10 (3.3%)	4 (1.3%)	14	4.6%
81-90	1 (0.3%)	1 (0.3%)	2	0.7%

The nasal cavity 237(77.5%) was the commonest anatomical site involved followed by sinonasal area 35(11.4%) and paranasal sinuses 34(11.1%) (Figure 3).

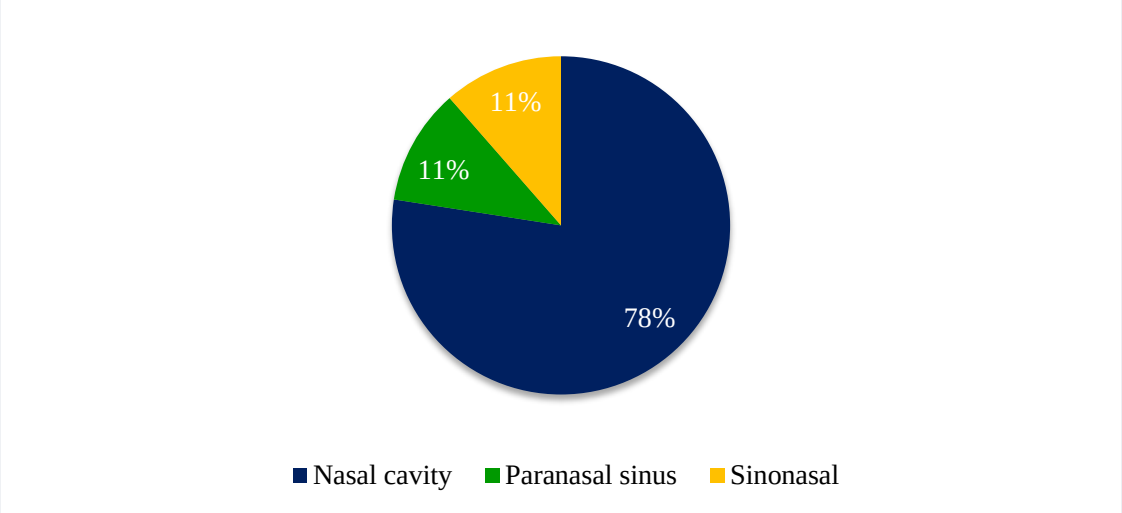

Fig. 3: Anatomical Site Distribution of Sinonasal Lesions

Regarding the histopathologic types of lesions, Neoplastic lesions 169(55.2%) were found to be higher than Non-neoplastic lesions 137(44.8%) (Figure 4). Neoplastic 39(12.7%) and Non-neoplastic lesions 42(13.7%) commonly occurred in 21-30 years of age group (Figure 5), with preponderance of male 107(35%), 73(23.9%) and commonly involved the nasal cavity 127(41.5%), 110(35.9%) respectively (Figures 6 and 7).

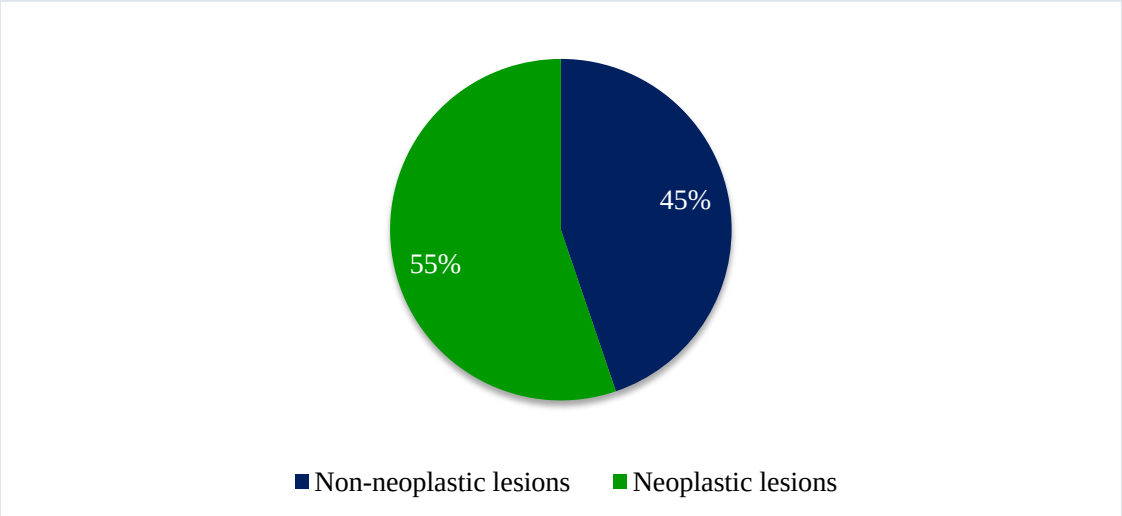

Fig. 4: Histopathologic Lesions of Sinonasal Tract

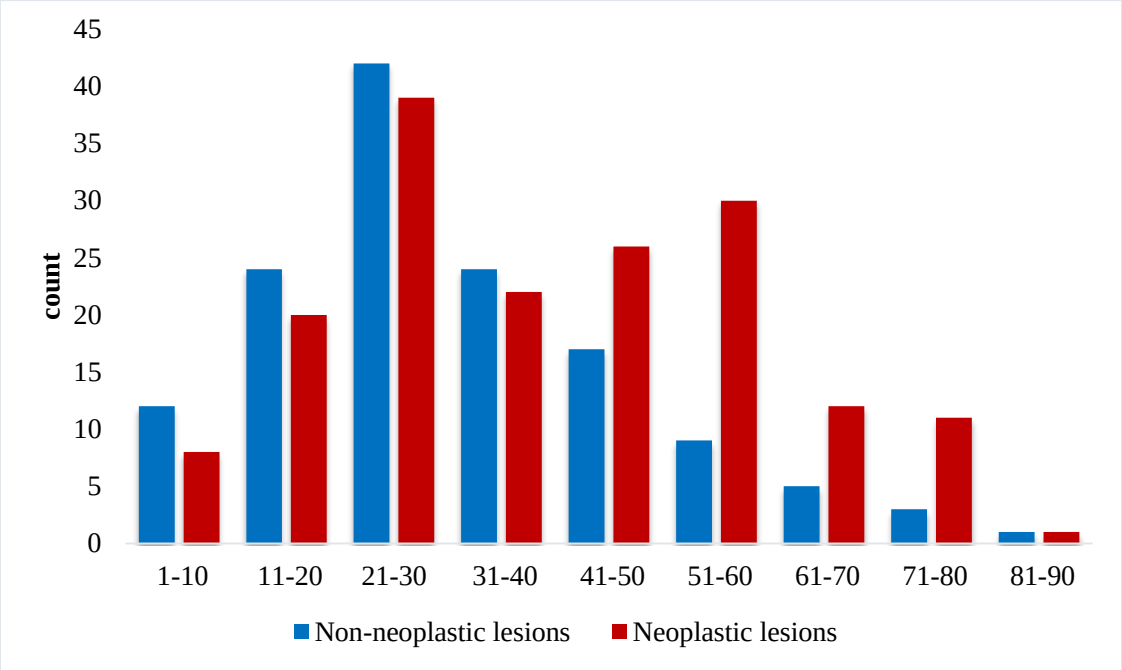

Fig. 5: Distribution of Histopathologic Lesions in Various Age Groups

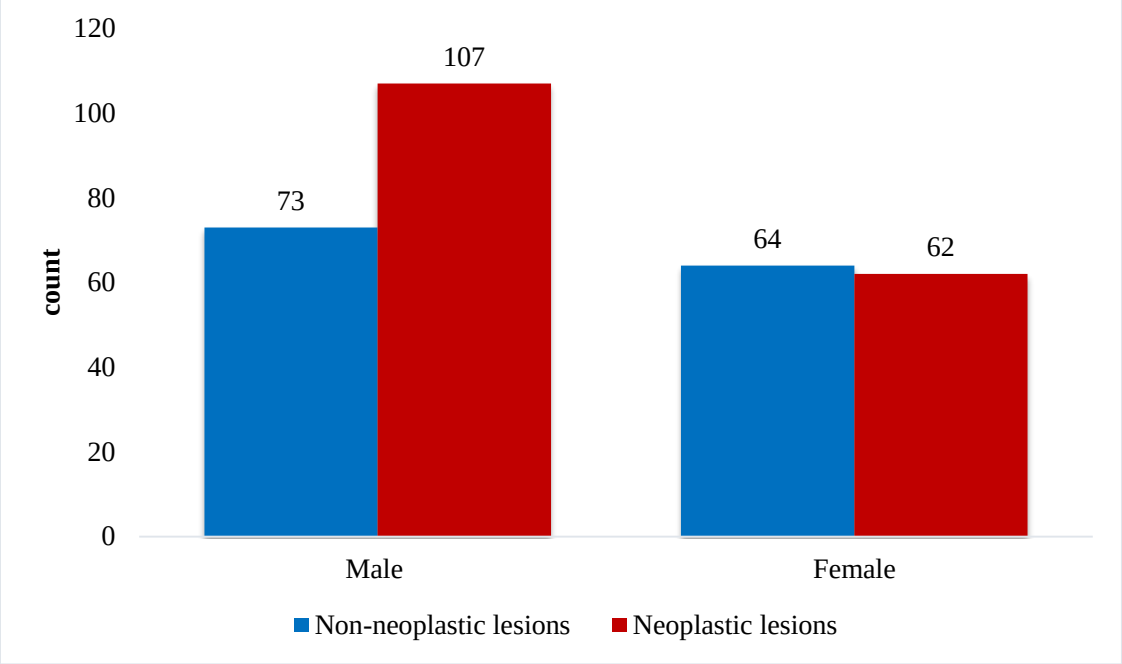

Fig. 6: Distribution of Histopathologic Lesions by Gender

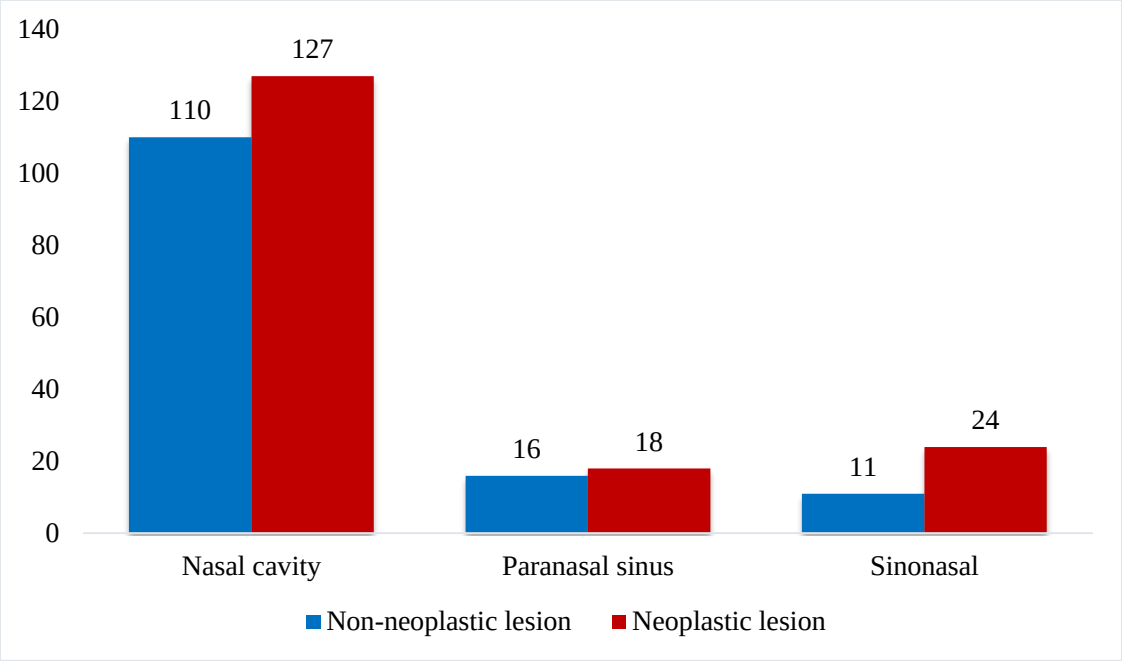

Fig. 7: Distribution of Histopathologic Lesions by Anatomic Site

In Neoplastic lesions, benign neoplastic lesions 83(49.1%) were marginally higher that malignant neoplastic lesions 82(48.5%) and potentially malignant lesions were 4(2.44%) (Figure 8).

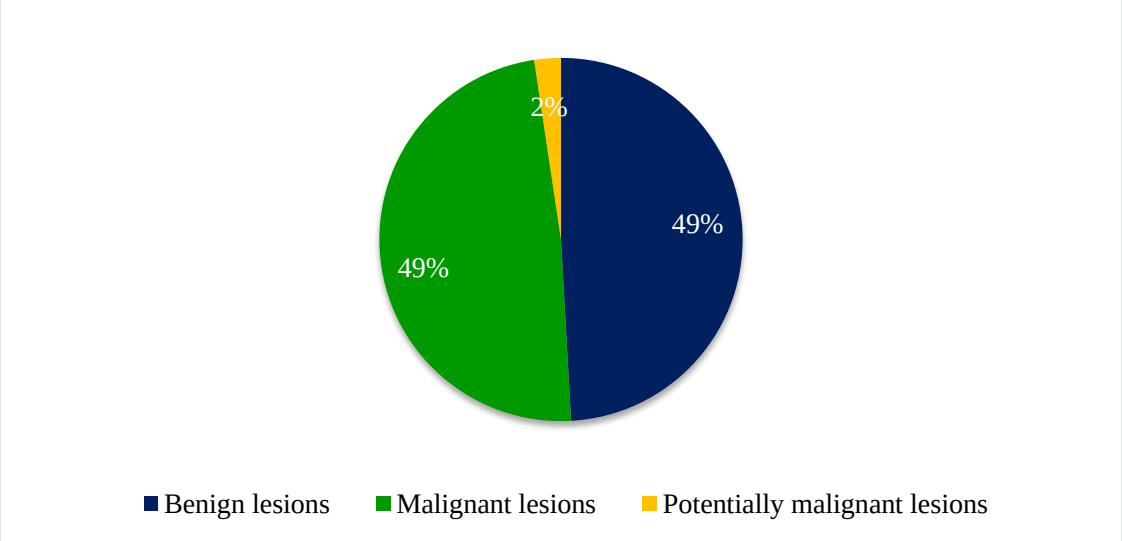

Fig. 8: Histopathologic Types of Neoplastic Sinonasal Lesions

Benign lesions commonly occurred in the age group of 21-30 years (Table 4). Of the 83 benign neoplastic cases, Sinonasal papilloma was the most common 34(41%) followed by Hemangioma 22(26.5%) and thirdly Angiofibroma 14(16.9%) (Table 2). Of the sinonasal papillomas, Inverted papilloma 26(76.5%) was the commonest followed by Exophytic papilloma 3(8.8%) and 1(2.9%) case of squamous papilloma was found. Lobular capillary hemangioma 15(68.2%) followed by cavernous hemangioma 3(13.6%) were noted under hemangiomas.

Angiofibroma occurred exclusively in males. Preponderance in males was seen with sinonasal papilloma (M: F= 2.4:1) and in females seen with hemangioma (M: F= 1:1.4). The mean age of presentation of sinonasal papilloma was 48.15 years; most cases were seen in 51-60 years of age group. The maximum age was 80 years and minimum was 10 years, while the mean age of hemangioma and angiofibroma was 32.45 years and 24.79 years, both maximum age of 60 years and minimum of 3 and 15 years respectively.

Table 2 : List of Benign Neoplastic lesions of Sinonasal Tract

Benign neoplastic lesions	**No. of cases**	**Percentage (%)**	**% of total cases**
Sinonasal papilloma	**34**	11.1	**41.0**
Hemangioma	22	7.2	26.5
Angifibroma	14	4.6	16.9
Schwannoma	2	0.7	2.4
Osteoblastoma	1	0.3	1.2
Fibrous dysplasia	3	1.0	3.6
Ossifying fibroma	2	0.7	2.4
Fibroosseous lesion	1	0.3	1.2
Pleomorphic adenoma	1	0.3	1.2
Leiomyoma	1	0.3	1.2
Fibroepithelial polyp	2	0.7	2.4

Malignant lesions commonly occurred in the age group of 41-50 years. Of the 82 malignant cases, squamous cell carcinoma and undifferentiated Nasopharyngeal carcinoma accounted for 21(25.6%) cases followed by undifferentiated carcinoma 7(8.5%), adenocarcinoma 6(7.3%) and basal cell carcinoma 5(6.1%). Malignant melanoma and High grade NHL with 4 cases each,

olfactory neuroblastoma, plasmacytoma and rhabdomyosarcoma with two cases each were also seen among the malignant tumors as shown in (Table 3).

Table 3 : List of Malignant Neoplastic lesions of Sinonasal Tract

Malignant neoplastic lesions	No. of cases	Percentage (%)	% of total cases
Squamous cell carcinoma	**21**	6.9	**25.6**
Adenocarcinoma	6	2.0	7.3
Nasopharyngeal carcinoma(UNPC)	**21**	6.9	**25.6**
High grade lymphoma(NHL)	4	1.3	4.9
Basal cell carcinoma	5	1.6	6.1
Malignant Melanoma	4	1.3	4.9
Rhabdomyosarcoma	2	0.7	2.4
Plasmacytoma	2	0.7	2.4
Small round cell tumor(MSRBCT)	2	0.7	2.4
Olfactory Neuroblastoma	2	0.7	2.4
Undifferentiated carcinoma	7	2.3	8.5
High grade spindle cell sarcoma	1	0.3	1.2
High grade pleomorphic sarcoma	1	0.3	1.2
Undifferentiated malignant tumor	4	1.3	4.9

Of the squamous lesions, Non-keratinizing squamous cell carcinoma 14(66.7%) was commonly diagnosed followed by papillary and basaloid squamous cell carcinomas (each 2 cases) and 1 case of keratinizing squamous cell carcinoma. Of the 6 Adenocarcinoma cases, 4(66.7%) were intestinal type adenocarcinoma and 2(33.3%) were diagnosed as Adenocarcinoma,NOS.

Male predominance was seen in both squamous cell carcinoma (M: F= 2.5:1) and undifferentiated Nasopharyngeal carcinoma (M: F= 3.2:1), While female predominance was seen in Adenocarcinoma (M: F=1:2). Malignant melanoma and Plasmacytoma exclusively occurred in males and Rhabdomyosarcoma in females in our study.

Squamous cell carcinoma commonly occurred in 31-40 years of age followed by 5^{th} and 6^{th} decades, with 3 cases seen in 21-30 years of age. Adenocarcinoma commonly occurred in both 21-30 and 41-50 years of age. The mean age presentation for Squamous cell carcinoma and Adenocarcinoma was 48.67 years and 34.52 years with both minimum age presentation of 23

and maximum age of 77 and 75 years respectively. Undifferentiated NPC presented with mean age of 34.5 years with minimum of 12 and maximum age of 75 years (Table 6).

Of the 4 potentially malignant lesions, 2(50%) cases were carcinoma in situ with the remaining 2 cases diagnosed as inverted papilloma with carcinoma in situ (25%) and inverted papilloma with high grade dysplasia (25%). The mean age of presentation for carcinoma insitu was 33.5 years, minimum age being 32 and maximum 35 years. Inverted papilloma with carcinoma insitu presented at the age of 63 years and high grade dysplasia presented at the age of 60 years (Table 4). These lesions showed preponderance of male (M: F=3:1).

Table 4 : Distribution of Neoplastic Lesions in Various Age Groups

Neoplastic lesions		**Age Group**									
		1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	No. of cases
	Sinonasal papilloma	1	0	6	6	4	**11**	4	2	0	**34**
	Hemangioma	2	2	**8**	3	4	3	0	0	0	**22**
	Angifibroma	0	**9**	3	0	1	1	0	0	0	**14**
Benign	Schwannoma	1	0	0	1	0	0	0	0	0	2
Lesions	Osteoblastoma	0	0	1	0	0	0	0	0	0	1
	Fibrous dysplasia	0	0	3	0	0	0	0	0	0	3
	Ossifying fibroma	0	0	1	0	0	1	0	0	0	2
	Fibroosseous lesion	0	0	0	0	1	0	0	0	0	1
	Pleomorphic adenoma	0	0	1	0	0	0	0	0	0	1
	Leiomyoma	0	0	1	0	0	0	0	0	0	1
	Fibroepithelial polyp	1	0	1	0	0	0	0	0	0	2
	Squamous cell carcinoma	0	0	3	**5**	4	4	3	2	0	**21**
	Adenocarcinoma	0	0	2	0	2	1	0	0	1	6
	Nasopharyngeal carcinoma(UNPC)	0	**7**	5	1	4	2	0	2	0	**21**
	High grade lymphoma(NHL)	1	0	0	0	1	1	1	0	0	4
	Basal cell carcinoma	0	0	0	0	1	2	0	2	0	5
Malignant	Malignant Melanoma	0	0	0	0	1	2	0	1	0	4
Lesions	Rhabdomyosarcoma	1	0	0	1	0	0	0	0	0	2
	Plasmacytoma	0	0	0	0	0	0	1	1	0	2
	Small round cell tumor(MSRBCT)	1	1	0	0	0	0	0	0	0	2
	Olfactory Neuroblastoma	0	0	2	0	0	0	0	0	0	2
	Undifferentiated carcinoma	0	0	0	2	**3**	1	1	0	0	**7**
	High grade spindle cell sarcoma	0	0	0	0	0	0	1	0	0	1
	High grade pleomorphic sarcoma	0	1	0	0	0	0	0	0	0	1
	Undifferentiated malignant tumor	0	0	2	1	0	0	0	1	0	4
Potential malignant	Carcinoma in situ	0	0	0	**2**	0	0	0	0	0	**2**
Lesions	Inverted papilloma with high grade dysplasia	0	0	0	0	0	1	0	0	0	1
	Inverted papilloma with carcinoma insitu	0	0	0	0	0	0	1	0	0	1

Of the 137 Non-neoplastic cases, sinonasal polyps were the most common with 100(73.0%) cases followed by Rhinosporidiosis 9(6.6%) and benign non-neoplastic cysts 8(5.8%). Four cases of mucocele, 2 cases of tuberculosis and 1 case of mucormycosis were seen among the lesions as shown in (Table 5).

Table 5 : List of Non-neoplastic Lesions of Sinonasal Tract

Non-neoplastic lesions	No. of cases	Percentage (%)	% of total cases
Sinonasal polyps	**100**	32.7	**73.0**
Rhinosporidiosis	**9**	2.9	**6.6**
Mucormycosis	1	0.3	0.7
Tuberculosis	2	0.7	1.5
Mucocele	4	1.3	2.9
Granulomatous inflammation	3	1.0	2.2
Sinonasal hamartoma	2	0.7	1.5
Benign non neoplastic cysts	8	2.6	5.8
Others	8	2.6	5.8

The Sinonasal polyps were commonly inflammatory polyps 78(78%) followed by non-specific Sinonasal polyps 12(12%) and Antrocoanal polyps 9(9%). Benign non neoplastic cysts, included Radicular, inflammatory and benign cysts, 2(25%) each and 1(12.5%) case of nasolabial and inclusion cyst each.

Preponderance of females was seen with Sinonasal polyps (M: F=1:1.2) and Mucocele (M: F=1:3) while male was seen with benign non-neoplastic cysts (M: F=3:1). Rhinosporidiosis and Mucormycosis were exclusively seen in males in our study.

Sinonasal polyp and Rhinosporidiosis commonly occurred in 21-30 years of age (Table 6). The mean age of presentation of sinonasal polyp was 32.28 years with maximum age of 83 and minimum age of 5 years. Rhinosporidiosis was noted with a mean age of 16.11 years, maximum age at presentation was 30 years and minimum age was 1 year.

Table 6 : Distribution of Non-neoplastic Lesions in Various Age Groups

Non-neoplastic lesions	**Age groups**									
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	No. of cases
Sinonasal polyps	9	16	**31**	19	12	7	2	3	1	**100**
Rhinosporidiosis	3	2	**4**	0	0	0	0	0	0	**9**
Mucormycosis	0	0	1	0	0	0	0	0	0	1
Tuberculosis	0	2	0	0	0	0	0	0	0	2
Mucocele	0	0	2	1	0	0	1	0	0	4
Granulomatous inflammation	0	1	0	0	0	1	1	0	0	3
Sinonasal hamartoma	0	0	1	1	0	0	0	0	0	2
Benign non-neoplastic cysts	0	1	2	3	2	0	0	0	0	8
Others	0	2	1	0	3	1	1	0	0	8

6. Discussion

In the present study, age of presentation showed a wide range from 1to 90 years. Maximum cases were noted in age group of 21-30 years. This is in agreement with studies done in India and Nepal [20,24] in which majority of patients were in age groups 21-30 and 16-30years, with age ranges between 1 and 80 years respectively. The wide age range could be due to inadequate public awareness and low medical seeking behaviour of our population.

The mean age of presentation with Sinonasal lesions in our study was 36.62 years which was almost similar with a study done in Rwanda with mean age of 36.5years but higher average age presentation of 38.2 years was seen in Saudi Arabia and a lower average age was seen in Nigeria with 33.3 years [26, 27, 28].

The observed male to female ratio in this study was 1.4:1which was in concordance with most literatures except in Rwanda and Nigeria where female preponderance was seen with ratio of 1:1.25 and 1:1.2 respectively [27, 28].

Nasal cavity (77.5%) was the commonest anatomical site involved in the present study which is in agreement with studies done in India and Sri Lanka accounting for 80 and 51% respectively[21,25].

Neoplastic cases (13.7%) were observed to be higher than Non- neoplastic cases (12.7%) in our study ,which is in concordance with a study in Rwanda which showed 52.04% neoplastic lesions and 45.57% Non- neoplastic cases[27], but studies from most literatures showed predominance of non-neoplastic lesions [20,21,22,24,25].

In the present study, out of 137 non neoplastic cases, Sinonasal polyps were the most common with 73.0% of cases with 1:1.2 male: female ratio and commonly occurred in age group of 21-30 years followed by Rhinosporidiosis (6.6%) and benign cysts (5.8%), Which is in agreement with studies in Rwanda where these lesions commonly occurred in 2nd and 3rd decade with M: F ratio 1:1.25, and similar descending order of the above non-neoplastic lesions [27]. Less than 20 years

of age was observed in Nigeria as the commonest age presentation which was lower than our observation [28].

Nasal inflammatory polyps were found to be the commonest non neoplastic lesion in most literatures as per our study and showed male preponderance which was not in agreement with this study that showed predominance of females [20, 21, 22, 24, 25, 26].

Study in Sri Lanka showed fungal infections accounting for 7.3% of all Sinonasal lesions with Rhinosporidiosis accounting for 7.1% which was similar to the present study and Mucormycosis about 24.7% which was much higher compared to our study where only 1 case of Mucormycosis seen[25].

In this study benign and malignant lesions showed almost similar incidences with benign slightly higher than malignant lesions accounting for 49.1% and 48.5% respectively. The finding was comparable in India with benign lesions marginally higher than malignant lesions but in variance with incidence accounting for 9.01 and 10.66% respectively [20]. Other studies showed higher differences between these lesions in terms of incidence [23, 25, 27].

Of the 83 benign lesions, inverted Sinonasal papilloma (41%) was the most common followed by Hemangioma(26.5%) and Angiofibroma(16.9%). Similar results were observed in Pakistan where inverted papilloma accounted for 13.23% followed by 2.94% of Hemangioma[23]. In Sri Lanka, inverted papilloma (42.3%) was followed by Angiofibroma (15.38%), whereas Hemangioma was the commonest benign lesion followed by inverted Sinonasal papilloma in Rwanda and India [20,25,27].

Preponderance of males was seen in Sinonasal papilloma in our study which was similar with other studies [25,27]. Predominance of females in Hemangioma was seen with our study and similar observation was done in Rwanda [27]. Angiofibroma was found exclusively in males with most literatures as was in our study.

The mean age presentation for Angiofibroma was 24.79 years in our study with the minimum age of 15 and maximum 60 years; studies in Rwanda showed 1 cases each for Angiofibroma, in

3rd and 8th decades [27] . The maximum age presentations in our study could be due to late visit of patients to medical facility.

Of the 82 malignant lesions, the most common tumours were squamous cell carcinoma and Nasopharyngeal carcinoma accounting for 25.6% each followed by undifferentiated carcinoma (8.5%), adenocarcinoma (7.3%) and basal cell carcinoma (6.1%).

Malignant melanoma, High grade NHL, Olfactory Neuroblastoma, Plasmacytoma and Rhabdomyosarcoma were also seen in descending order among the malignant tumours in the present study

.

A study in Tanzania showed the commonest anatomical site for head and neck cancer was the Sinonasal tract which showed the highest variation in histopathologic diagnosis with predominance of squamous cell carcinoma [14].This is in concordance with most literatures and ours where squamous cell carcinoma was the commonest but differed in the incidence of lesions following SCC like; India showing malignant melanoma as the 2nd commonest tumour followed by Nasopharyngeal carcinoma, Adenocarcinoma followed by high grade NHL in Sri Lanka, Adenoidcystic carcinoma followed by olfactory Neuroblastoma in Rwanda, Adenocarcinoma followed by Malignant Melanoma and High grade NHL in Ghana; and Adenocarcinoma followed by Mucoepidermoid carcinoma in Nigeria[19,20,25,27,29].

Squamous cell carcinoma showed Male predominance in most literatures, similar with our study and commonly occurred in 4th decade followed by 5th and 6th decade with 3 cases seen in the 3rd decade, that related with an Indian study, which determined malignant lesions seen in young adults with the commonest age group of 41-50 years and correlated these lesions and benign ones with the role of HPV in which out of 30 Papillomas, 7 cases were HPV6/11 positive and of 9 cases of Squamous cell carcinoma HPV16/18 was present in 2 cases [30]. HPV status was not known as the facility for testing HPV was not available in our centre. Other studies showed common age presentation in 7th, 6th and 7th and 8th decade respectively [20, 25,27].

Previous studies in African countries showed that HIV infected individuals with a head and neck cancer were younger and have a higher risk of hosting HPV oncogenic strains [16]. The serostatus of patients was not known in our study.

7. Study Limitations

- Due to inconvenient data keeping and storage we were unable to find the estimated number of histopathologic reports during the study period.
- Socio-demographic data were incomplete on few of the request papers which further lessened our data.
- We were unable to include Clinical findings in the study and; radiologic findings for the exact anatomical site of lesions because clinico-radiologic information was not written on the request paper.

8. Conclusion and Recommendation

8.1 Conclusion

Nasal cavity and paranasal sinuses, despite having occupied a small area in the head and neck region, are a source of various neoplastic and non-neoplastic lesions with a heterogeneous histopathologic diagnosis. The sinonasal lesions can present with similar clinical features hence, Clinical history and radiological studies can help reach at a presumptive diagnosis but histopathology remains the mainstay of final and definitive diagnosis.

This study shows mainly comparable results with other literatures with few variances. The most affected age group was 21-30years and least affected was 81-90 yrs. Male predominance was seen compared to females. Inflammatory sinonasal polyp was the commonest non neoplastic lesion, whereas inverted sinonasal papilloma was the commonest benign neoplastic lesion and squamous cell carcinoma along with nasopharyngeal carcinoma were the commonest malignant lesions observed.

8.2 Recommendations

- The general population including health care providers should be educated to create awareness on symptoms of sinonasal lesions and encourage patients to visit health institutions early.

- Sociocultural beliefs and practices like self-medication, use of herbs and continuous use of over the counter drugs for sinonasal symptoms should be discouraged by continuous education of our community.

- Histopathologic examination of sinonasal masses should be done for definitive diagnosis.

- HIV serologic test and HPV DNA PCR testing should be done for patients with sinonasal masses.

- Socio-demographic data, clinical history and radiologic finding should be complete on the request paper by clinicians.

- The data keeping method should improve and be convenient for conducting a research or any analysis.

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ANNEX 1. Data Extraction Sheet for the Histopathologic Study of Sinonasal lesions at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia: From January1, 2016 to August31, 2020.

Sr. No.	Sex	VARIABLES OF STUDY					
		Age			Anatomical Site	Diagnosis	Year of study
		Day	Month	Year			
1							
2							
3							
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